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Yellowtail flounder, redfish (*Sebastes spp.*) and witch flounder indices from the Spanish Survey conducted in Divisions 3NO of the NAFO Regulatory Area

by

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**Abstract**

Since 1995, Spain carries out a spring stratified random bottom trawl survey in Div. 3NO of the NAFO Regulatory Area. Total mean catches, biomass and mean numbers for yellowtail flounder (*Limanda ferruginea*) are presented for the period 1995-2014, for redfish (*Sebastes spp.*) for the period 1997-2014 and for witch flounder (*Glyptocephalus cynoglossus*) for the period 2002-2014. Detailed indices are presented from 2009. Yellowtail flounder indices do not show a clear trend. Biomass increased from 1997 to 1999 and then remained almost constant throughout all the period, decreasing slightly in 2014. Redfish indices oscillate greatly over time, probably because the gear does not sample adequately aggregating pelagic species. There was a sharp increase in 2009 and since then has maintained higher values than before 2009, comprising the 3N around the 90% of the total biomass in the last years. In 2014 there was a decrease in all the indices in both Divisions. Good year classes have not been registered recently. Witch flounder is very scarce and its indices show a general decreasing trend throughout the period (2002-2014) remaining at very low levels. Recruitment was quite good at the beginning of the series but very poor in recent years.

**Material and methods**

The Spanish Spring (May/June) survey in Div. 3NO of NAFO Regulatory Area was initiated by Spain in 1995. Until 2001, the survey was carried out on board the Spanish vessel C/V *Playa de Menduñña* (338 GT and 800 HP) using a *Pedreira* type bottom trawl. The R/V *Vizconde de Eza* replaced the C/V *Playa de Menduñña* in 2001, and the *Campelen* 1800 was implemented as survey gear. The main specifications and geometry of these gears, their rigging profile and the net plan, and the survey technical information are described in Walsh *et al.* (2001). The survey area was stratified following the standard stratification schemes (Bishop, 1994). Set number was allocated proportionally to the area of the strata, with a minimum of two planed hauls per stratum, and trawl positions were chosen at random (Doubleday, 1981). Biomass indices were calculated by the swept area method (Cochran, 1997), assuming catchability factor of 1. Table 1 presents the number of valid tows, the depth strata covered and the dates of the total survey series. Table 2 shows the swept area and number of hauls by stratum for the last five years (2010-2014). To know the results of the rest of the years, see González-Troncoso *et al.*, 2013. More information on the calibration method can be found in González-Troncoso *et al.* (2004) and Paz *et al.* (2004).

In each haul, all the individuals caught were sorted by species and weighted. Random samples of the catch of each species were length measured (total length) to the nearest lower cm. The obtained length distribution was aggregated into 2 cm intervals (beginning with the pair number) and raised to the catch of each species.

The redfish series for total biomass and total mean catches and mean number per tow start in 1997 because sampling depth in 1995 and 1996 was shallower than 1000 meters so the data are not representative for this species. As all strata, where the yellowtail flounder is caught were well surveyed, the series for this species are presented since 1995. As calibration for witch flounder data has not been done yet, only data from 2002 to 2014 are presented. Data for yellowtail flounder and redfish were calibrated for the period 1995-2000 and non-transformed from 2002 onwards, to create a combined 1995-2014 time-series. Regarding 2001, there are both calibrated (from the former vessel) and non-transformed data (from the new vessel).

Mean catch and variance per haul, biomass and length distribution by strata are presented for each species for the last five years (2010-2014). To see the results of the rest of the years, see González-Troncoso *et al.*, 2013. Total biomass and mean catch per tow with SD and mean number per tow by year are presented for the total period series.

Figure 1 presents the maps with the distribution of the catches of the three species during the 2014 Spanish 3NO survey.

## Results

### Yellowtail flounder

After a moratorium between 1994 and 1997, the yellowtail flounder fishery has been under TAC. According to the Report of NAFO Scientific Council Meeting, stock size reached a minimum in the mid 1990's, but since 1994 has steadily increased and is now well above  $B_{msy}$ . There is very low risk of the stock being below  $B_{msy}$  or  $F$  being above  $F_{msy}$ . Recent recruitment appears about average (NAFO, 2014).

### **Mean Catches and Biomass**

Table 3 shows mean catch and SD per haul and stratum and Table 4 the biomass estimates by the swept area method and their SD by stratum for years 2010-2014 for yellowtail flounder. Total biomass (t) and stratified mean catch per tow (kg) and SD by year for the entire series are presented in Table 5. Table 6 presents the parameters  $a$  and  $b$  for the calculation of the length-weight relationship for years 2010-2014.

Yellowtail flounder biomass index shows no clear trend throughout the study period. It increased substantially from 1997 (9 264 t) to 1999 (197 012 t), has maintained almost constant values until 2013 (197 968 t) and then decreased slightly in 2014 (136 487 t) (Table 5; Figures 2 and 3).

### **Length Distribution**

The mean number per haul by year is presented in Table 7 and Figure 2 for 1995-2014 and Table 8 presents the same index by length, sex and year besides the sampled size and catch for the period 2010-2014. Figures 4 and 5 present these indices for the entire period. The mean numbers are in concordance with the mean catch (Figure 2). There has not been good recruitment in recent years. In Figure 4, we can follow a length modal value since the beginning of the series, but the presence of juveniles is very low. This mode can be seen until 2009 when it reached 34-35 cm, and since 2010 the mode of the length distribution was about 30-34 cm. In 2012, 2013 and 2014 the mode was at 34 cm for females, and at 30 cm for males.

### Redfish

There are two species of redfish that have been commercially fished in Div. 3NO; the deep-sea redfish (*Sebastes mentella*) and the Acadian redfish (*Sebastes fasciatus*). Due to the difficulty to distinguish the two species, the catches are usually reported by genus as "redfish" (*Sebastes spp.*) in the commercial fishery statistics. This stock in Div. 30 has been under TAC regulation since 1974. In September 2004, the Fisheries Commission adopted an annual TAC of 20 000 t in the entire area of Div. 30. The stock appears to have increased since the early 2000s. Current fishing mortality appears low and recent recruitment is unknown. Survey indices increased or remained stable between years during the period 2009 to 2012, but both spring and autumn indices fell considerably in 2013 to below 2009 levels. Persistent and high variability in the

indices makes it difficult to reconcile year to year changes. In 3N (the stock is 3LN) a moratorium was implemented from 1998 to 2009. The fishery was reopened in 2010 with the resultant increase of catches but the perception of the stock given by the available surveys has not been altered. There is a low risk of the stock being below  $B_{msy}$ . The probability of being above  $F_{msy}$  is very low. Recent recruitment (2005-2013) appears to be above average (NAFO, 2014).

### **Mean Catches and Biomass**

Redfish mean catches and SD are presented in Table 9 and biomass in Table 10 by stratum for 2010-2014. Annual biomass and stratified mean catch and SD per haul for years 1997-2014 are presented in Table 11 by Division. The length-weight relationship parameters  $a$  and  $b$  are presented in Table 12 for years 2010-2014.

Redfish indices oscillate greatly over time, probably because the gear does not sample adequately aggregating pelagic species. They showed a quick increase from 1997 (5 947 t) to 2000 (99 226 t), followed by a sudden drop until 2002 (11 172 t), after which they have increased to the levels of the early years of the time series. The index increased nearly fivefold in 2009 (763 980 t) in comparison with 2005 (157 716 t), the second higher value of the series (Table 10; Figures 6 and 7). This was not just due to very large catches in few hauls, as redfish catch was over 1 ton in 11 of the 43 hauls in which redfish was caught. Furthermore, redfish catch was over 15 tons in three hauls. Since 2010 a decreasing trend has been observed, but the indices for these years has maintained higher values than before 2009 (Table 10; Figures 6 and 7).

Biomass and mean catch per haul and Division, the number of strata covered in each case, and the percentage of biomass in 3N respect to the total are presented in Table 11. Biomass is always larger in 3N than in 3O (Figure 8), although the percentage is very spread over the time. Since 2005, more than 83% of redfish catches have occurred in Division 3N. However, the mean catch per tow is usually higher in Division 3O. In 2010, mean catch per tow in 3O was almost four times higher than in 2009, whereas in 3N was lower than in 2009. Total biomass in 3NO increased, due to the increase in 3N. In 2013 the increase in the total biomass seems to be because the increase in Division 3N. In 2014, all indices decreased in both Divisions.

### **Length Distribution**

Mean number per haul by year is presented in Table 13 and Figure 6 for 1997-2014. Table 14 presents this index per length with sample size and catch for the period 2009-2014. Figures 9 and 10 show the trend of the mean abundance per tow by length class. The y-axis upper limit of Figure 10 has been changed for years 1997-2008 to see the length distribution despite the large catches registered in the period 2009-2014. The last good year class was recorded in 2004 and this cohort can be tracked until 2014. In recent years there is only a discrete presence of juveniles. The clear 18 cm mode (20 cm in 2011) in 2009 seems to be a consequence of the 2004 recruitment. In 2012 and 2013 the mode is in 20 cm and in 20-22 cm in 2014.

### **Witch flounder**

This stock occurs mainly in Div. 3O, along the South-western slopes of the Grand Bank, but it seems to migrate seasonally onto the shallow banks. It has been fished mainly in winter and springtime, targeting the spawning concentrations. The Div. 3NO estimates of biomass index for the Canadian surveys, although variable, have shown a general decreasing trend from 1985 to 1998 followed by an increase from 1998 to 2003. From 2010 to 2013 the index increased to values near the series high from 1987, although the 2013 point estimate is imprecise. Recruitment (fish less than 21 cm) has been poor since 2002. The stock has increased since 2010 and is likely to be above  $B_{lim}$  since 2011, although the current status is measured with high uncertainty. Scientific Council recommended that future removals, if allowed to increase, should only increase in an adaptive, gradual manner from current catch levels (NAFO, 2014). The stock was reopened to fishery in 2015 with a very low TAC (1 000 tons).

### **Mean Catches and Biomass**

Witch flounder mean catches and SD by stratum are presented in Table 15 and biomass per stratum in Table 16 for 2010-2014. In Table 17 and Figures 11 and 12 the annual stratified mean catch per tow and biomass with SD are presented for the period 2002-2014. The length-weight relationship parameters  $a$  and  $b$  are presented in Table 18 for 2010-2014.

Witch flounder indices show a general decreasing trend throughout the period 2002-2014. Biomass fluctuated with very low values from 1 784 t in 2002 to a depressed level of 903 t in 2014. Highest values were found in 2003 (3 145 t), 2004 (3 348 t) and 2010 (3 239 t) (Table 15; Figures 11 and 12).

### **Length Distribution**

Table 19 and Figures 13 and 14 present witch flounder mean number per tow and sex by year for 2002-2014, and Table 20 the same index by length with sample size and catch for the period 2009-2014. The best recruitment events occurred in the period 2002-2005 and have been very poor since 2008. Some modes can be tracked in Figure 13, probably due to the recruitments at the beginning of the series. In 2012 and 2013 there was a quite good presence of individuals of lengths 34-42 cm, not found in 2014.

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Table 1. Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1995-2014.

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1995	<i>C/V Playa de Mendiña</i>	77	42-684	May 18-May 29
1996	<i>C/V Playa de Mendiña</i>	112	41-1135	May 07-May 24
1997	<i>C/V Playa de Mendiña</i>	128	42-1263	April 26-May 18
1998	<i>C/V Playa de Mendiña</i>	124	42-1390	May 06-May 26
1999	<i>C/V Playa de Mendiña</i>	114	41-1381	May 07-May 26
2000	<i>C/V Playa de Mendiña</i>	118	42-1401	May 07-May 28
2001 <sup>(*)</sup>	<i>R/V Vizconde de Eza</i>	83	36-1156	May 03-May 24
	<i>C/V Playa de Mendiña</i>	121	40-1500	May 05-May 23
2002	<i>R/V Vizconde de Eza</i>	125	38-1540	April 29-May 19
2003	<i>R/V Vizconde de Eza</i>	118	38-1666	May 11-June 02
2004	<i>R/V Vizconde de Eza</i>	120	43-1539	June 06-June 24
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2006	<i>R/V Vizconde de Eza</i>	120	45-1480	June 7-June 27
2007	<i>R/V Vizconde de Eza</i>	110	45-1374	May 29-June 19
2008	<i>R/V Vizconde de Eza</i>	122	45-1374	May 27-June 16
2009	<i>R/V Vizconde de Eza</i>	109	45-1374	May 31-June 18
2010	<i>R/V Vizconde de Eza</i>	95	45-1374	May 30-June 18
2011	<i>R/V Vizconde de Eza</i>	122	44-1450	June 5-June 24
2012	<i>R/V Vizconde de Eza</i>	122	44-1450	June 3-June 21
2013	<i>R/V Vizconde de Eza</i>	122	44-1450	June 1-June 21
2014	<i>R/V Vizconde de Eza</i>	122	44-1450	June 2-June 21

(\*)For the calculation of the series, 83 hauls were taken from the *R/V Vizconde de Eza* and 40 hauls from the *C/V Playa de Mendiña* (123 hauls in total)

Table 2. Swept area and number of hauls by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2010-2014. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	2010		2011		2012		2013		2014	
	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0225	2	0.0349	3	0.0338	3	0.0349	3	0.0379	3
354	0.0225	2	0.0345	3	0.0338	3	0.0338	3	0.0394	3
355	0.0229	2	0.0233	2	0.0229	2	0.0225	2	0.0263	2
356	0.0225	2	0.0229	2	0.0225	2	0.0225	2	0.0266	2
357	0.0225	2	0.0225	2	0.0229	2	0.0236	2	0.0263	2
358	0.0225	2	0.0345	3	0.0330	3	0.0338	3	0.0390	3
359	0.0705	6	0.0806	7	0.0806	7	0.0829	7	0.0908	7
360	0.1628	14	0.2374	20	0.2344	20	0.2231	19	0.2629	20
374	0.0225	2	0.0225	2	0.0229	2	0.0233	2	0.0259	2
375	0.0364	3	0.0360	3	0.0349	3	0.0360	3	0.0390	3
376	0.0788	7	0.1178	10	0.1181	10	0.1305	11	0.1324	10
377	0.0233	2	0.0233	2	0.0229	2	0.0236	2	0.0259	2
378	0.0225	2	0.0240	2	0.0229	2	0.0225	2	0.0263	2
379	0.0229	2	0.0221	2	0.0225	2	0.0240	2	0.0255	2
380	0.0236	2	0.0229	2	0.0229	2	0.0229	2	0.0263	2
381	0.0244	2	0.0233	2	0.0221	2	0.0244	2	0.0259	2
382	0.0233	2	0.0450	4	0.0454	4	0.0484	4	0.0521	4
721	0.0225	2	0.0229	2	0.0233	2	0.0225	2	0.0266	2
722	0.0225	2	0.0225	2	0.0221	2	0.0221	2	0.0259	2
723	0.0225	2	0.0218	2	0.0225	2	0.0221	2	0.0259	2
724	0.0229	2	0.0233	2	0.0225	2	0.0225	2	0.0255	2
725	0.0233	2	0.0240	2	0.0225	2	0.0229	2	0.0255	2
726	0.0233	2	0.0225	2	0.0221	2	0.0221	2	0.0248	2
727	0.0240	2	0.0225	2	0.0233	2	0.0229	2	0.0259	2
728	0.0240	2	0.0229	2	0.0229	2	0.0233	2	0.0248	2
752	0.0240	2	0.0236	2	0.0229	2	0.0233	2	0.0240	2
753	n.s.	n.s.	0.0225	2	0.0221	2	0.0236	2	0.0240	2
754	0.0225	2	0.0225	2	0.0221	2	0.0240	2	0.0225	2
755	0.0120	1	0.0454	4	0.0446	4	0.0454	4	0.0454	4
756	0.0225	2	0.0206	2	0.0221	2	0.0229	2	0.0229	2
757	0.0221	2	0.0236	2	0.0214	2	0.0240	2	0.0244	2
758	0.0225	2	0.0225	2	0.0221	2	0.0225	2	0.0221	2
759	0.0225	2	0.0218	2	0.0221	2	0.0225	2	0.0229	2
760	0.0225	2	0.0214	2	0.0225	2	0.0229	2	0.0364	3
761	0.0229	2	0.0236	2	0.0221	2	0.0225	2	0.0240	2
762	0.0229	2	0.0225	2	0.0225	2	0.0218	2	0.0229	2
763	n.s.	n.s.	0.0349	3	0.0330	3	0.0341	3	0.0233	2
764	n.s.	n.s.	0.0225	2	0.0225	2	0.0214	2	0.0259	2
765	0.0225	2	0.0225	2	0.0229	2	0.0221	2	0.0240	2
766	0.0225	2	0.0225	2	0.0225	2	0.0221	2	0.0221	2
767	n.s.	n.s.	0.0233	2	0.0203	2	0.0218	2	0.0221	2



Table 4. Yellowtail flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2010-2014. n.s. means stratum not surveyed.

<b>Strata</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Strata</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>353</b>	17	2366	214	806	23	<b>725</b>	0	0	0	0	0
<b>354</b>	15	16	15	17	0	<b>726</b>	0	0	0	0	0
<b>355</b>	0	0	2	0	0	<b>727</b>	0	0	0	0	0
<b>356</b>	0	0	0	0	0	<b>728</b>	0	0	0	0	0
<b>357</b>	0	0	0	0	0	<b>752</b>	0	0	0	0	0
<b>358</b>	0	8	7	0	0	<b>753</b>	n.s.	0	0	0	0
<b>359</b>	443	6767	4384	6466	1305	<b>754</b>	0	0	0	0	0
<b>360</b>	79998	90856	115943	114639	48586	<b>755</b>	0	0	0	0	0
<b>374</b>	9184	26552	16220	8549	8098	<b>756</b>	0	0	0	0	0
<b>375</b>	7388	11857	4858	8038	8355	<b>757</b>	0	0	0	0	0
<b>376</b>	81971	55789	48374	48457	70031	<b>758</b>	0	0	0	0	0
<b>377</b>	1054	2802	3549	639	84	<b>759</b>	0	0	0	0	0
<b>378</b>	0	0	0	0	3	<b>760</b>	0	0	0	0	0
<b>379</b>	0	0	0	0	0	<b>761</b>	0	0	0	0	0
<b>380</b>	0	0	0	0	0	<b>762</b>	0	0	0	0	0
<b>381</b>	0	0	0	152	0	<b>763</b>	n.s.	0	0	0	0
<b>382</b>	9617	6819	2038	207	0	<b>764</b>	n.s.	0	0	0	0
<b>721</b>	0	0	0	0	0	<b>765</b>	0	0	0	0	0
<b>722</b>	0	0	0	0	0	<b>766</b>	0	0	0	0	0
<b>723</b>	0	0	0	0	0	<b>767</b>	n.s.	0	0	0	0
<b>724</b>	0	0	0	0	0						

Table 5. Yellowtail flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year in NAFO Div. 3NO: 1995-2014.

<b>Year</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>Biomass</b>	9264	43349	38697	122601	197012	144685	182704	148487	136775	169978
<b>SD</b>	2484	6032	8527	31359	22938	19097	25847	23368	19287	18869
<b>MCPT</b>	16.22	59.54	47.74	137.32	232.41	167.76	210.84	164.28	148.92	190.05
<b>SD</b>	4.37	8.41	10.69	34.70	27.41	22.21	30.58	24.92	20.84	21.27
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<b>Year</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Biomass</b>	156472	160145	160731	160146	183412	189687	203833	195606	187969	136484
<b>SD</b>	15271	16458	18852	17297	25736	22611	30743	23679	22493	29519
<b>MCPT</b>	176.42	189.32	202.64	178.27	209.43	224.54	231.22	221.33	214.17	173.79
<b>SD</b>	17.06	19.83	23.61	19.00	29.75	26.30	35.18	26.27	25.35	38.52



Table 6. Yellowtail flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2010-2014. E(x) means Error of the parameter x.

Year	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2010	<b>0.00835</b>	<b>2.98405</b>	0.1175	0.0367	0.995	313	<b>0.0058</b>	<b>3.0980</b>	0.0809	0.0241	0.998	444	<b>0.0052</b>	<b>3.1285</b>	0.0966	0.029	0.996	759
2011	<b>0.01213</b>	<b>2.87117</b>	0.2513	0.0758	0.981	435	<b>0.0063</b>	<b>3.0725</b>	0.1587	0.0462	0.992	575	<b>0.0080</b>	<b>3.0081</b>	0.1225	0.0366	0.994	1015
2012	<b>0.00940</b>	<b>2.94448</b>	0.3281	0.1018	0.984	417	<b>0.0047</b>	<b>3.1527</b>	0.2378	0.0712	0.992	494	<b>0.0048</b>	<b>3.1471</b>	0.2299	0.0699	0.992	914
2013	<b>0.00147</b>	<b>3.47842</b>	0.8688	0.2588	0.866	436	<b>0.0110</b>	<b>2.9156</b>	0.1599	0.0463	0.991	588	<b>0.0055</b>	<b>3.1012</b>	0.2729	0.0839	0.968	1039
2014	<b>0.01661</b>	<b>2.81259</b>	0.1442	0.0449	0.993	354	<b>0.0119</b>	<b>2.9123</b>	0.1445	0.0428	0.992	506	<b>0.0162</b>	<b>2.8240</b>	0.1218	0.0383	0.993	861

Table 7. Yellowtail flounder mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1995-2014. Indet. means indeterminate.

	1995				1996				1997				1998				1999			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	31.12	47.36	6.14	84.62	73.11	188.83	13.23	275.17	134.85	147.98	0.00	282.83	279.83	343.35	1.61	624.79	508.72	539.70	4.48	1052.90
	2000				2001				2002				2003				2004			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	332.06	376.36	0.00	708.42	328.27	428.33	6.98	763.57	256.56	333.09	0.81	590.46	215.96	271.49	0.72	488.17	322.91	336.03	1.19	660.14
	2005				2006				2007				2008				2009			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	275.52	308.25	0.30	584.07	281.15	354.69	0.60	636.44	317.34	365.53	0.10	682.97	295.11	335.10	0.15	630.35	298.01	398.88	0.48	697.37
	2010				2011				2012				2013				2014			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	368.83	414.09	0.00	782.92	305.92	426.42	0.00	732.34	315.50	438.48	0.75	754.73	294.58	394.06	0.79	689.43	226.69	293.78	0.03	520.50

Table 8. Yellowtail flounder mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2010-2014. Indet. means indeterminate.

Length (cm.)	2010				2011				2012				2013				2014			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.297	0.297	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.066	0.000	0.043	0.076	0.119	0.000	0.000	0.027	0.027
10	0.302	0.302	0.000	0.605	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.096	0.000	0.000	0.076	0.076	0.090	0.027	0.000	0.117
12	1.243	0.364	0.000	1.607	0.000	0.000	0.000	0.000	0.294	0.096	0.085	0.475	0.000	0.000	0.078	0.078	0.027	0.027	0.000	0.054
14	0.387	0.400	0.000	0.787	0.077	0.013	0.000	0.090	0.683	0.292	0.210	1.185	0.071	0.097	0.147	0.314	0.471	0.458	0.000	0.929
16	0.489	0.107	0.000	0.596	0.698	0.627	0.000	1.324	0.548	0.507	0.000	1.055	0.328	0.071	0.060	0.458	0.724	0.584	0.000	1.308
18	1.276	0.982	0.000	2.259	2.421	2.221	0.000	4.642	0.845	0.663	0.289	1.797	0.253	0.253	0.060	0.565	0.883	0.362	0.000	1.245
20	3.363	2.601	0.000	5.964	2.628	3.051	0.000	5.678	2.130	2.825	0.000	4.955	0.891	1.003	0.000	1.894	1.621	0.831	0.000	2.452
22	6.263	8.252	0.000	14.515	2.412	2.282	0.000	4.694	7.317	6.789	0.000	14.106	2.740	3.140	0.000	5.879	2.910	1.182	0.000	4.093
24	19.027	15.268	0.000	34.295	8.451	5.504	0.000	13.954	11.515	10.017	0.000	21.532	7.487	8.263	0.000	15.749	3.649	3.951	0.000	7.600
26	44.312	25.334	0.000	69.646	25.580	14.079	0.000	39.659	29.809	19.368	0.000	49.177	23.234	16.665	0.000	39.898	10.794	7.617	0.000	18.410
28	60.163	45.618	0.000	105.781	52.525	34.993	0.000	87.517	69.232	42.103	0.000	111.335	54.912	27.949	0.000	82.861	31.696	19.603	0.000	51.299
30	86.814	52.865	0.000	139.679	70.813	52.249	0.000	123.062	81.097	64.012	0.000	145.109	78.158	46.704	0.000	124.862	69.017	39.870	0.000	108.887
32	92.461	52.351	0.000	144.811	80.108	53.396	0.000	133.504	66.077	63.104	0.000	129.181	73.177	62.970	0.000	136.146	65.608	51.680	0.000	117.289
34	40.660	66.701	0.000	107.361	44.691	75.990	0.000	120.681	33.748	73.592	0.000	107.340	37.376	68.287	0.000	105.662	30.734	58.923	0.000	89.656
36	9.675	70.786	0.000	80.461	12.199	76.297	0.000	88.496	8.716	67.450	0.000	76.166	12.654	65.653	0.000	78.307	6.218	49.180	0.000	55.398
38	1.757	41.724	0.000	43.481	2.488	53.131	0.000	55.619	2.711	49.593	0.000	52.305	2.544	49.874	0.000	52.418	1.728	28.656	0.000	30.384
40	0.631	18.241	0.000	18.872	0.618	32.793	0.000	33.411	0.432	23.634	0.000	24.066	0.522	26.657	0.000	27.179	0.377	19.238	0.000	19.615
42	0.000	8.403	0.000	8.403	0.124	15.014	0.000	15.138	0.181	9.291	0.000	9.472	0.173	10.849	0.000	11.022	0.069	8.649	0.000	8.718
44	0.000	1.785	0.000	1.785	0.083	2.984	0.000	3.067	0.166	3.726	0.000	3.893	0.062	4.626	0.000	4.688	0.069	2.164	0.000	2.233
46	0.000	1.496	0.000	1.496	0.000	1.351	0.000	1.351	0.000	1.032	0.000	1.032	0.000	0.746	0.000	0.746	0.000	0.706	0.000	0.706
48	0.000	0.341	0.000	0.341	0.000	0.404	0.000	0.404	0.000	0.242	0.000	0.242	0.000	0.114	0.000	0.114	0.000	0.075	0.000	0.075
50	0.000	0.034	0.000	0.034	0.000	0.045	0.000	0.045	0.000	0.051	0.000	0.051	0.000	0.032	0.000	0.032	0.000	0.000	0.000	0.000
52	0.000	0.139	0.000	0.139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	0.000	0.061	0.000	0.000	0.000	0.000
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.000	0.096	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	368.825	414.092	0.000	782.917	305.915	426.422	0.000	732.337	315.502	438.483	0.746	754.732	294.581	394.056	0.794	689.431	226.685	293.784	0.027	520.497
N° samples:				36				50				52				48				45
N° Ind.:	3085	3615	0	6700	5500	6259	0	11759	4523	6150	10	10683	5314	6587	16	11917	3004	3975	1	6980
Sampled catch:				1805				3535				3104				3504				2217
Range:				10-52				15-50				8-58				6-54				8-48
Total catch:				12449				20193				18359				17513				14027
Total hauls:				95				122				122				122				122



Table 10. Redfish survey biomass (t) by stratum in NAFO Div. 3NO: 2010-2014. n.s. means stratum not surveyed.

<b>Strata</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Strata</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>353</b>	0	0	17	0	0	<b>725</b>	11487	1031	2688	4739	712
<b>354</b>	641	12568	13552	9444	478	<b>726</b>	1617	292	161	102	37
<b>355</b>	34178	12456	10505	7269	1708	<b>727</b>	506	367	135	2840	237
<b>356</b>	36069	39873	3107	9523	6972	<b>728</b>	174	28	86	208	37
<b>357</b>	35827	16336	26596	41850	5441	<b>752</b>	21	9	8	25	1
<b>358</b>	160486	262502	78425	122562	40393	<b>753</b>	n.s.	0	0	0	0
<b>359</b>	30907	11103	1438	17272	38361	<b>754</b>	0	0	0	7	0
<b>360</b>	11	0	0	30	7	<b>755</b>	0	0	0	6	0
<b>374</b>	0	0	0	0	0	<b>756</b>	8	1	6	0	5
<b>375</b>	0	0	0	0	0	<b>757</b>	0	0	0	3	4
<b>376</b>	0	1	0	0	0	<b>758</b>	0	0	0	0	0
<b>377</b>	0	0	0	69	0	<b>759</b>	0	0	0	0	0
<b>378</b>	16055	62648	93021	198482	47113	<b>760</b>	30	148	0	21	6
<b>379</b>	69163	5892	14649	5409	21861	<b>761</b>	0	0	0	0	0
<b>380</b>	21582	37169	14288	11264	13034	<b>762</b>	0	0	0	0	0
<b>381</b>	3	409	8239	40	0	<b>763</b>	n.s.	16	0	0	0
<b>382</b>	0	0	0	0	0	<b>764</b>	n.s.	26	0	0	1
<b>721</b>	849	4384	1568	2926	3359	<b>765</b>	0	0	0	0	0
<b>722</b>	24	43	47	22	261	<b>766</b>	0	0	0	0	0
<b>723</b>	10296	19564	24386	23352	10113	<b>767</b>	n.s.	0	0	0	0
<b>724</b>	1360	786	1114	1249	694						

Table 11. Redfish survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 1997-2014.

<b>Div</b>	<b>Year</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
<b>3NO</b>	<b>Biomass</b>	5947	40909	76564	99226	63350	11172	15714	35275	157716
	<b>SD</b>	988	20512	27740	33453	41460	2374	3224	7332	52646
	<b>MCPT</b>	6.79	43.25	85.45	112.71	73.14	12.43	17.21	38.60	175.79
	<b>SD</b>	1.15	19.50	29.56	40.03	48.13	2.60	3.55	8.05	58.86
	<b>N° Strata</b>	36	41	41	41	41	41	41	41	41
<b>3N</b>	<b>Biomass</b>	4753	22540	46459	68928	53855	7620	11031	27016	146918
	<b>SD</b>	353	17632	25022	33109	41371	2106	3199	7174	52267
	<b>MCPT</b>	6.14	26.32	58.78	90.12	71.16	9.62	13.83	33.95	187.61
	<b>SD</b>	0.46	18.33	30.08	45.16	55.00	2.61	4.05	9.06	67.31
	<b>N° Strata</b>	27	31	31	31	31	31	31	31	31
<b>3O</b>	<b>Biomass</b>	1194	18369	30105	30298	9494	3552	4684	8259	10797
	<b>SD</b>	922	10490	12129	6073	2702	1117	369	1326	2728
	<b>MCPT</b>	11.41	159.86	269.16	268.32	86.80	31.74	40.55	70.63	94.35
	<b>SD</b>	8.68	87.87	107.03	54.27	24.47	9.78	3.10	11.68	24.19
	<b>N° Strata</b>	9	10	10	10	10	10	10	10	10
<b>3N/Total (%) Biomass</b>		80	55	61	69	85	68	70	77	93
<b>Div</b>	<b>Year</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>3NO</b>	<b>Biomass</b>	103029	98805	74172	763980	431296	487655	294033	458716	190832
	<b>SD</b>	23332	15893	26168	145765	69575	107982	62954	76825	54478
	<b>MCPT</b>	118.76	125.66	82.20	670.46	506.43	543.17	320.52	502.58	240.24
	<b>SD</b>	27.83	20.19	29.14	172.93	81.06	124.68	72.27	79.94	69.17
	<b>N° Strata</b>	41	36	41	39	37	41	41	41	41
<b>3N</b>	<b>Biomass</b>	87830	87602	68059	735743	359536	418305	265238	429532	178055
	<b>SD</b>	22675	15364	25890	143334	58306	99454	60304	76128	54133
	<b>MCPT</b>	115.44	124.79	86.51	721.67	473.94	533.85	330.89	539.18	256.34
	<b>SD</b>	30.96	22.09	33.12	194.48	76.53	132.71	80.20	91.06	79.00
	<b>N° Strata</b>	31	28	31	30	29	31	31	31	31
<b>3O</b>	<b>Biomass</b>	15199	11203	6113	28238	71760	69350	28795	29184	12778
	<b>SD</b>	5279	3362	3258	16762	37821	41858	16754	7503	3927
	<b>MCPT</b>	141.64	132.90	52.55	280.98	772.76	607.40	249.04	250.43	129.36
	<b>SD</b>	52.04	39.93	28.27	163.87	402.81	362.85	140.90	64.52	39.61
	<b>N° Strata</b>	10	8	10	9	8	10	10	10	10
<b>3N/Total (%) Biomass</b>		85	89	92	96	83	86	90	94	93

Table 12. Redfish length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2010-2014. E(x) means Error of the parameter x.

Year	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2010	<b>0.01286</b>	<b>0.07840</b>	3.0017	0.0248	0.998	282	<b>0.0140</b>	<b>0.0892</b>	2.98638	0.0275	0.998	298	<b>0.0105</b>	<b>0.0668</b>	3.06573	0.0217	0.998	585
2011	<b>0.01148</b>	<b>0.10130</b>	3.0459	0.0311	0.997	524	<b>0.0131</b>	<b>0.1267</b>	3.01034	0.0386	0.995	588	<b>0.0047</b>	<b>0.1154</b>	3.30791	0.0368	0.995	1235
2012	<b>0.01148</b>	<b>0.12340</b>	2.9031	0.0371	0.998	341	<b>0.0167</b>	<b>0.1631</b>	2.94082	0.049	0.996	418	<b>0.0158</b>	<b>0.1171</b>	2.95433	0.0351	0.998	759
2013	<b>0.01306</b>	<b>0.13360</b>	2.98309	0.0409	0.994	482	<b>0.0149</b>	<b>0.1068</b>	2.95412	0.0312	0.997	479	<b>0.0106</b>	<b>0.0838</b>	3.04983	0.0263	0.997	1017
2014	<b>0.01117</b>	<b>0.305050</b>	0.0736	0.0234	0.998	424	<b>0.0136</b>	<b>2.9921</b>	0.1084	0.0318	0.997	387	<b>0.0113</b>	<b>3.0464</b>	0.0625	0.0199	0.998	821

Table 13. Redfish mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1997-2014. Indet. means indeterminate.

	1997				1998				1999				2000				2001			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	22.38	14.94	0.00	37.32	108.36	114.09	0.02	222.47	289.50	200.84	0.39	490.73	518.31	326.79	0.00	845.10	279.45	158.85	1.10	439.41
	2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	46.49	37.53	1.05	85.06	71.00	46.21	0.82	118.03	122.61	94.97	19.57	237.15	573.80	502.15	95.21	1171.16	398.90	293.94	247.70	940.54
	2007				2008				2009				2010				2011			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	368.68	313.47	3.01	685.15	329.78	259.80	2.00	591.59	3754.48	2846.50	3.64	6604.62	2009.91	1807.51	0.23	3817.65	2385.24	1906.21	9.10	4300.55
	2012				2013				2014											
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total								
MNPT	1184.89	981.01	0.31	2166.20	2034.96	1542.08	0.38	3577.42	742.09	639.39	0.41	1381.88								

Table 14. Redfish mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2010-2014. Indet. means indeterminate.

Lenght (cm)	2010				2011				2012				2013				2014			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.022
6	0.007	0.000	0.101	0.109	0.000	0.000	0.174	0.174	0.000	0.000	0.039	0.039	0.000	0.000	0.327	0.327	0.064	0.000	0.085	0.150
8	0.015	0.019	0.000	0.033	0.000	0.000	0.155	0.155	0.000	0.000	0.182	0.182	0.427	0.000	0.056	0.482	0.021	0.000	0.106	0.127
10	0.015	0.000	0.000	0.015	0.000	0.074	0.177	0.251	0.000	0.000	0.077	0.077	0.247	0.000	0.000	0.247	0.010	0.000	0.201	0.211
12	0.015	0.007	0.000	0.022	0.990	0.456	1.294	2.741	0.004	0.036	0.008	0.049	0.207	0.000	0.000	0.207	0.034	0.008	0.000	0.042
14	0.184	0.000	0.000	0.184	11.860	8.726	7.290	27.876	1.181	1.981	0.000	3.162	0.329	0.000	0.000	0.329	0.147	0.000	0.000	0.147
16	108.602	26.757	0.000	135.358	61.607	64.245	0.007	125.860	23.574	5.428	0.000	29.001	4.075	1.763	0.000	5.838	2.111	3.014	0.000	5.125
18	823.922	542.608	0.000	1366.530	766.590	365.669	0.000	1132.259	191.476	74.149	0.000	265.624	152.717	45.982	0.000	198.698	57.245	17.786	0.000	75.031
20	610.079	704.422	0.000	1314.501	1215.754	991.597	0.000	2207.351	715.886	393.611	0.000	1109.497	1266.873	551.383	0.000	1818.256	353.948	126.173	0.000	480.121
22	219.541	214.975	0.000	434.516	219.501	310.021	0.000	529.522	167.953	303.957	0.000	471.910	496.753	707.239	0.000	1203.992	242.008	252.294	0.000	494.302
24	178.206	127.535	0.000	305.742	85.212	73.057	0.000	158.269	50.679	80.796	0.000	131.475	71.268	143.489	0.000	214.758	63.344	135.739	0.000	199.083
26	51.762	94.471	0.000	146.233	17.255	39.551	0.000	56.806	23.257	40.965	0.000	64.222	24.290	44.182	0.000	68.472	18.428	42.912	0.000	61.340
28	9.461	49.090	0.000	58.551	4.258	28.841	0.000	33.099	7.073	43.349	0.000	50.422	3.186	23.874	0.000	27.060	2.230	31.128	0.000	33.358
30	2.305	26.479	0.000	28.783	0.384	17.283	0.000	17.667	1.459	23.110	0.000	24.569	5.827	16.799	0.000	22.626	0.866	18.874	0.000	19.740
32	1.388	12.161	0.000	13.549	0.460	4.280	0.000	4.740	0.653	6.588	0.000	7.241	2.200	4.369	0.000	6.569	0.468	8.424	0.000	8.891
34	2.257	5.426	0.000	7.684	0.585	1.460	0.000	2.045	0.567	3.613	0.000	4.179	1.655	1.804	0.000	3.459	0.483	1.840	0.000	2.324
36	1.104	1.764	0.000	2.869	0.479	0.639	0.000	1.118	0.629	2.010	0.000	2.639	4.402	0.781	0.000	5.183	0.456	0.877	0.000	1.332
38	0.671	0.775	0.000	1.447	0.195	0.237	0.000	0.431	0.368	0.495	0.000	0.863	0.291	0.293	0.000	0.584	0.138	0.203	0.000	0.340
40	0.375	0.589	0.000	0.963	0.113	0.030	0.000	0.143	0.119	0.056	0.000	0.175	0.126	0.070	0.000	0.196	0.060	0.084	0.000	0.144
42	0.000	0.236	0.000	0.236	0.000	0.036	0.000	0.036	0.007	0.006	0.000	0.013	0.085	0.046	0.000	0.131	0.015	0.018	0.000	0.033
44	0.000	0.201	0.000	0.201	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.004	0.004	0.000	0.008	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860	0.000	0.860	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.011
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.011
Total	2009.908	1807.515	0.232	3817.654	2385.243	1906.208	9.097	4300.549	1184.885	981.008	0.306	2166.200	2034.960	1542.077	0.383	3577.420	742.086	639.385	0.414	1381.885
N° samples:				42				44				43				51				46
N° Ind.:	2796	2841	32	5669	3845	3633	241	7719	4019	3986	40	8045	4182	4210	34	8426	2851	3000	27	5878
Sampled catch:				1265				1524				1517				1726				1230
Range:				5-45				6-45				7-49				6-45				5-54
Total catch:				82169				95569				50184				78332				42046
Total hauls:				95				122				122				122				122





Table 16. Witch flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2010-2014. n.s. means stratum not surveyed.

Strata	2010	2011	2012	2013	2014	Strata	2010	2011	2012	2013	2014
353	955	56	406	255	86	725	29	18	14	46	21
354	108	110	88	204	35	726	36	48	23	120	28
355	14	21	20	0	4	727	94	30	53	86	22
356	3	2	2	4	2	728	142	55	120	56	75
357	19	29	15	6	8	752	2	14	21	55	86
358	185	60	150	52	69	753	n.s.	13	0	8	14
359	78	157	386	388	62	754	0	0	0	0	0
360	745	280	933	323	36	755	0	0	0	0	0
374	0	0	0	0	0	756	228	76	43	46	82
375	0	0	6	0	0	757	36	15	15	45	50
376	0	0	1	12	0	758	6	0	0	0	0
377	0	0	0	4	0	759	0	0	0	0	0
378	0	0	2	6	11	760	48	125	107	89	43
379	7	2	6	0	8	761	146	81	93	35	13
380	7	2	6	3	10	762	20	0	0	0	0
381	0	22	44	13	0	763	n.s.	0	0	0	0
382	0	0	0	16	6	764	n.s.	12	9	48	4
721	18	11	4	5	3	765	20	8	2	3	8
722	15	5	5	20	11	766	11	4	3	0	1
723	158	84	21	33	64	767	n.s.	0	0	0	0
724	109	88	165	95	41						

Table 17. Witch flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 2002-2014.

Year	2002	2003	2004	2005	2006	2007	2008
<b>Biomass</b>	1784	3145	3348	2633	2570	1480	2118
<b>SD</b>	426	690	523	488	629	229	481
<b>MCPT</b>	2.00	3.42	3.66	2.95	3.01	1.84	2.32
<b>SD</b>	0.49	0.75	0.56	0.56	0.73	0.28	0.52

Year	2009	2010	2011	2012	2013	2014
<b>Biomass</b>	1872	3239	1428	2763	2078	903
<b>SD</b>	423	777	248	648	367	134
<b>MCPT</b>	2.13	3.82	1.58	3.06	2.32	1.09
<b>SD</b>	0.48	0.91	0.28	0.74	0.41	0.16

Table 18. Witch flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2010-2014. E(x) means Error of the parameter x.

Year	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2010	<b>0.00253</b>	<b>3.25938</b>	0.1923	0.0562	0.992	193	<b>0.00161</b>	<b>3.38592</b>	0.2761	0.0779	0.983	327	<b>0.00220</b>	<b>3.30190</b>	0.2230	0.0641	0.986	520
2011	<b>0.00153</b>	<b>3.40467</b>	0.2368	0.0681	0.991	180	<b>0.00147</b>	<b>3.41280</b>	0.1470	0.0418	0.995	344	<b>0.00162</b>	<b>3.38866</b>	0.1040	0.0333	0.997	529
2012	<b>0.00202</b>	<b>3.31917</b>	0.1945	0.0557	0.996	199	<b>0.00147</b>	<b>3.39880</b>	0.1746	0.0484	0.997	281	<b>0.00162</b>	<b>3.38866</b>	0.1171	0.0346	0.998	487
2013	<b>0.00108</b>	<b>3.48692</b>	0.1785	0.0532	0.994	286	<b>0.00109</b>	<b>3.48450</b>	0.0815	0.0234	0.998	563	<b>0.00220</b>	<b>3.28882</b>	0.1559	0.0480	0.991	864
2014	<b>0.00060</b>	<b>3.65925</b>	0.2494	0.0709	0.991	134	<b>0.00096</b>	<b>3.52772</b>	0.1025	0.0286	0.998	278	<b>0.00217</b>	<b>3.30510</b>	0.1540	0.0440	0.994	415

Table 19. Witch flounder mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2002-2014. Indet. means indeterminate.

	2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	2.602	3.488	0.459	6.548	4.499	5.864	0.057	10.420	4.182	6.088	0.211	10.480	4.160	5.570	0.605	10.336	3.384	4.937	0.040	8.360
	2007				2008				2009				2010				2011			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	1.952	3.050	0.061	5.063	2.061	3.384	0.027	5.472	2.352	4.107	0.043	6.502	3.538	5.411	0.000	8.949	1.326	2.529	0.033	3.887
	2012				2013				2014											
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total								
MNPT	3.350	4.078	0.056	7.483	2.009	3.908	0.159	6.076	0.756	1.626	0.012	2.395								

Table 20. Witch flounder mean number per tow by length class and year. Spanish Spring Surveys in NAFO Div. 3NO: 2010-2014. Indet. means indeterminate.

Lenght (cm.)	2010				2011				2012				2013				2014			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.003	0.000	0.019	0.022	0.000	0.000	0.005	0.005	0.000	0.000	0.048	0.048	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.003	0.013	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.000	0.000	0.004	0.004
10	0.005	0.004	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.014	0.008	0.000	0.000	0.008	0.000	0.000	0.000	0.000
12	0.018	0.028	0.000	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.011	0.005	0.000	0.008	0.012	0.000	0.003	0.000	0.003
14	0.015	0.027	0.000	0.042	0.000	0.005	0.000	0.005	0.000	0.000	0.020	0.020	0.002	0.015	0.000	0.017	0.000	0.000	0.000	0.000
16	0.015	0.000	0.000	0.015	0.010	0.025	0.000	0.035	0.009	0.006	0.006	0.021	0.011	0.021	0.000	0.032	0.000	0.000	0.004	0.004
18	0.004	0.012	0.000	0.016	0.023	0.023	0.000	0.046	0.004	0.002	0.000	0.007	0.010	0.049	0.016	0.074	0.000	0.004	0.004	0.009
20	0.016	0.011	0.000	0.027	0.003	0.025	0.000	0.028	0.013	0.013	0.000	0.025	0.024	0.002	0.016	0.042	0.004	0.014	0.000	0.018
22	0.035	0.023	0.000	0.058	0.015	0.006	0.000	0.022	0.009	0.031	0.000	0.039	0.052	0.025	0.011	0.087	0.003	0.007	0.000	0.010
24	0.016	0.059	0.000	0.074	0.010	0.013	0.000	0.023	0.024	0.030	0.000	0.054	0.055	0.078	0.011	0.144	0.014	0.008	0.000	0.022
26	0.080	0.061	0.000	0.141	0.020	0.016	0.000	0.036	0.070	0.022	0.000	0.092	0.079	0.057	0.000	0.136	0.027	0.020	0.000	0.047
28	0.134	0.096	0.000	0.231	0.032	0.047	0.000	0.079	0.116	0.125	0.000	0.241	0.093	0.141	0.000	0.233	0.054	0.036	0.000	0.090
30	0.171	0.141	0.000	0.312	0.115	0.084	0.000	0.199	0.262	0.138	0.000	0.400	0.168	0.158	0.000	0.326	0.030	0.078	0.000	0.108
32	0.181	0.234	0.000	0.415	0.186	0.146	0.000	0.332	0.345	0.222	0.000	0.567	0.263	0.260	0.000	0.524	0.066	0.090	0.000	0.156
34	0.294	0.379	0.000	0.673	0.222	0.205	0.000	0.426	0.431	0.323	0.000	0.755	0.245	0.372	0.000	0.617	0.096	0.136	0.000	0.232
36	0.775	0.513	0.000	1.288	0.214	0.276	0.000	0.490	0.474	0.324	0.000	0.798	0.261	0.379	0.000	0.640	0.103	0.124	0.000	0.227
38	0.764	0.778	0.000	1.542	0.235	0.293	0.000	0.528	0.556	0.437	0.000	0.993	0.289	0.348	0.000	0.637	0.125	0.168	0.000	0.293
40	0.534	0.718	0.000	1.252	0.179	0.308	0.000	0.487	0.514	0.570	0.000	1.085	0.234	0.417	0.000	0.652	0.141	0.170	0.000	0.311
42	0.349	1.023	0.000	1.371	0.051	0.365	0.000	0.416	0.358	0.610	0.000	0.969	0.143	0.522	0.000	0.665	0.056	0.204	0.000	0.260
44	0.106	0.505	0.000	0.611	0.009	0.388	0.000	0.397	0.148	0.582	0.000	0.730	0.058	0.442	0.000	0.500	0.025	0.220	0.000	0.246
46	0.028	0.406	0.000	0.434	0.000	0.171	0.000	0.171	0.012	0.433	0.000	0.445	0.000	0.386	0.000	0.386	0.012	0.174	0.000	0.186
48	0.000	0.226	0.000	0.226	0.000	0.065	0.000	0.065	0.004	0.142	0.000	0.146	0.009	0.154	0.000	0.163	0.000	0.067	0.000	0.067
50	0.000	0.125	0.000	0.125	0.000	0.058	0.000	0.058	0.000	0.053	0.000	0.053	0.000	0.046	0.000	0.046	0.000	0.067	0.000	0.067
52	0.000	0.033	0.000	0.033	0.000	0.007	0.000	0.007	0.000	0.006	0.000	0.006	0.000	0.029	0.000	0.029	0.000	0.022	0.000	0.022
54	0.000	0.005	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005
56	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.007
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
62	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	3.538	5.411	0.000	8.949	1.326	2.529	0.033	3.887	3.350	4.078	0.056	7.483	2.009	3.908	0.159	6.076	0.756	1.626	0.012	2.395
N° samples:				48				64				67				67				53
N° Ind.:	350	609	0	959	193	377	5	575	392	541	11	944	315	592	25	932	131	271	3	405
Sampled catch:				399				220				398				330				188
Range:				11-56				7-52				7-55				6-58				8-57
Total catch:				410				235				398				356				189
Total hauls:				95				122				122				122				122

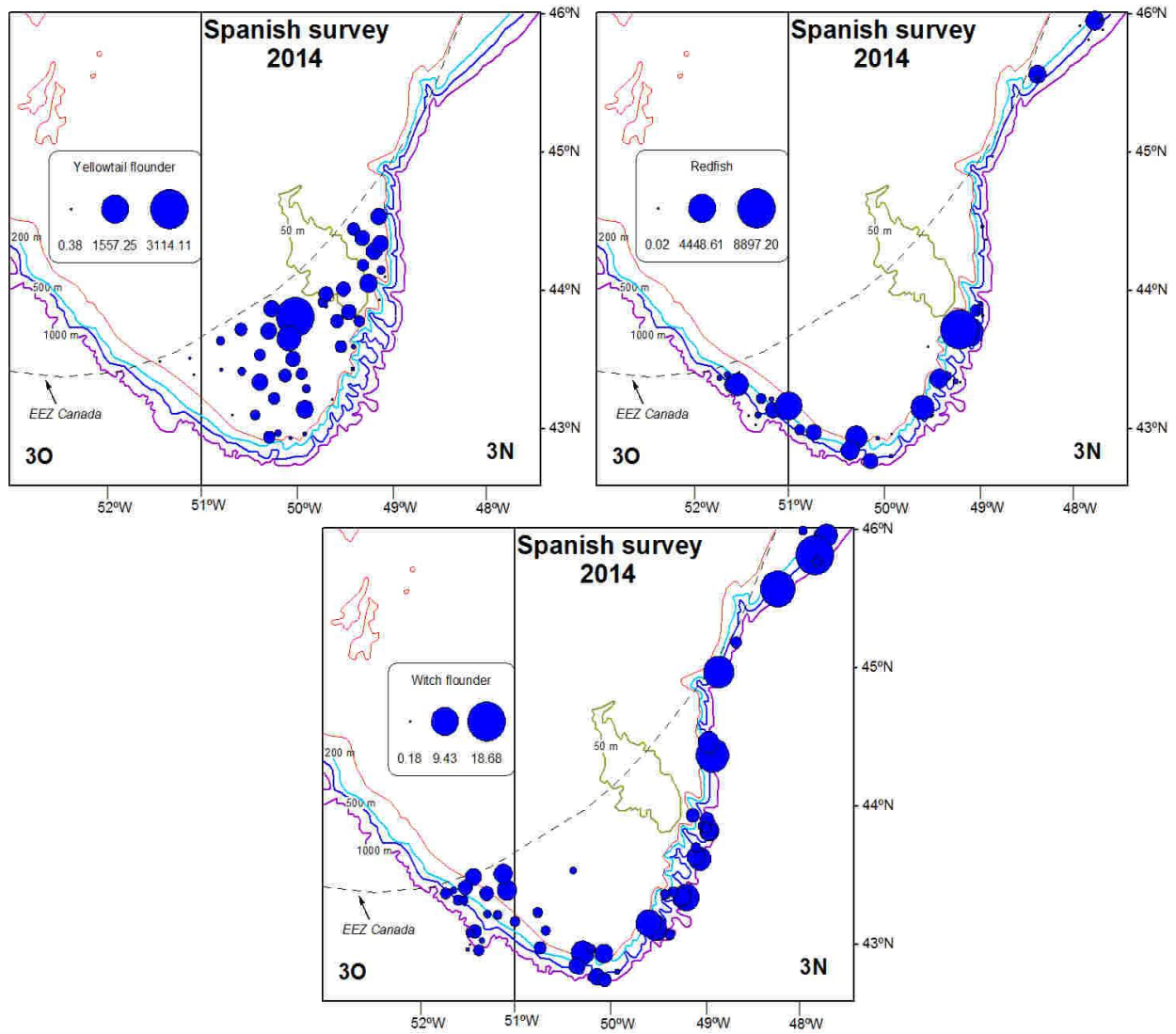


Figure 1. Position of the hauls and the catch of yellowtail flounder, redfish and witch flounder during the 2014 Spanish 3NO survey. Note that the scale is different in the three graphs.

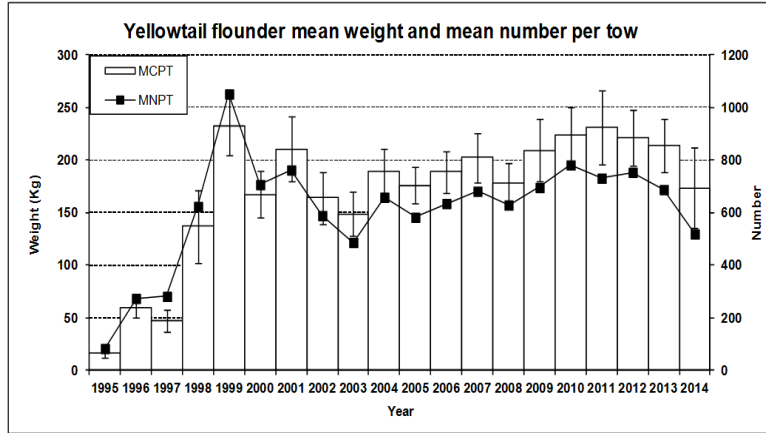


Figure 2. Yellowtail flounder stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2014.

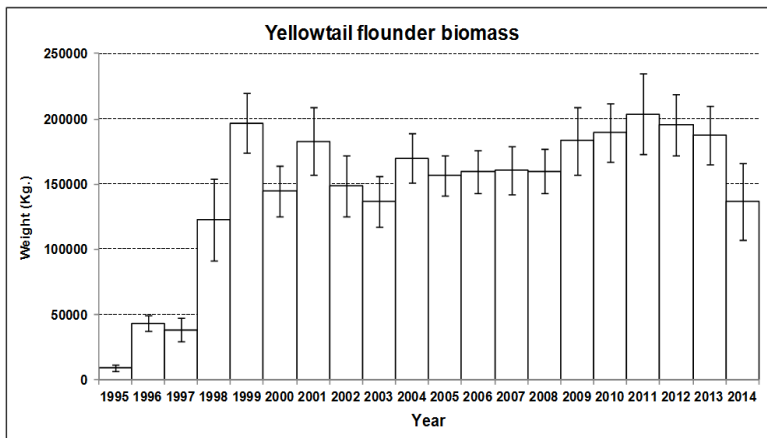


Figure 3. Yellowtail flounder biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2014.

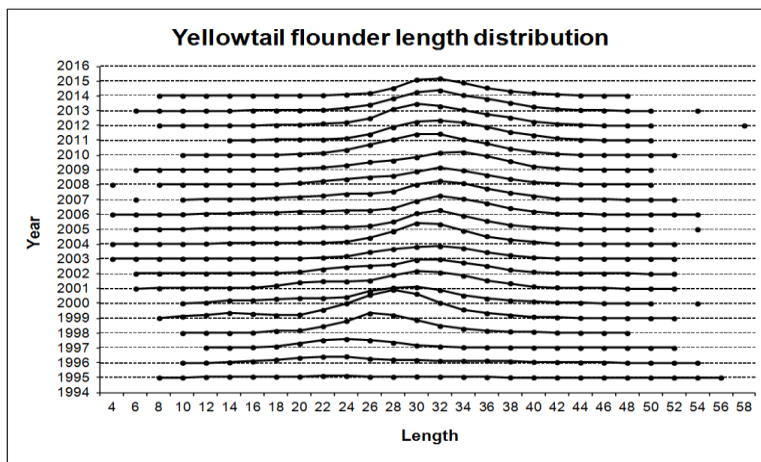


Figure 4. Yellowtail flounder mean catches per tow length distribution (cm) on NAFO 3NO: 1995-2014. Data from 2010 to 2014 are in Table 8; data for 1995-2009 can be seen in SCR Doc 13/11.

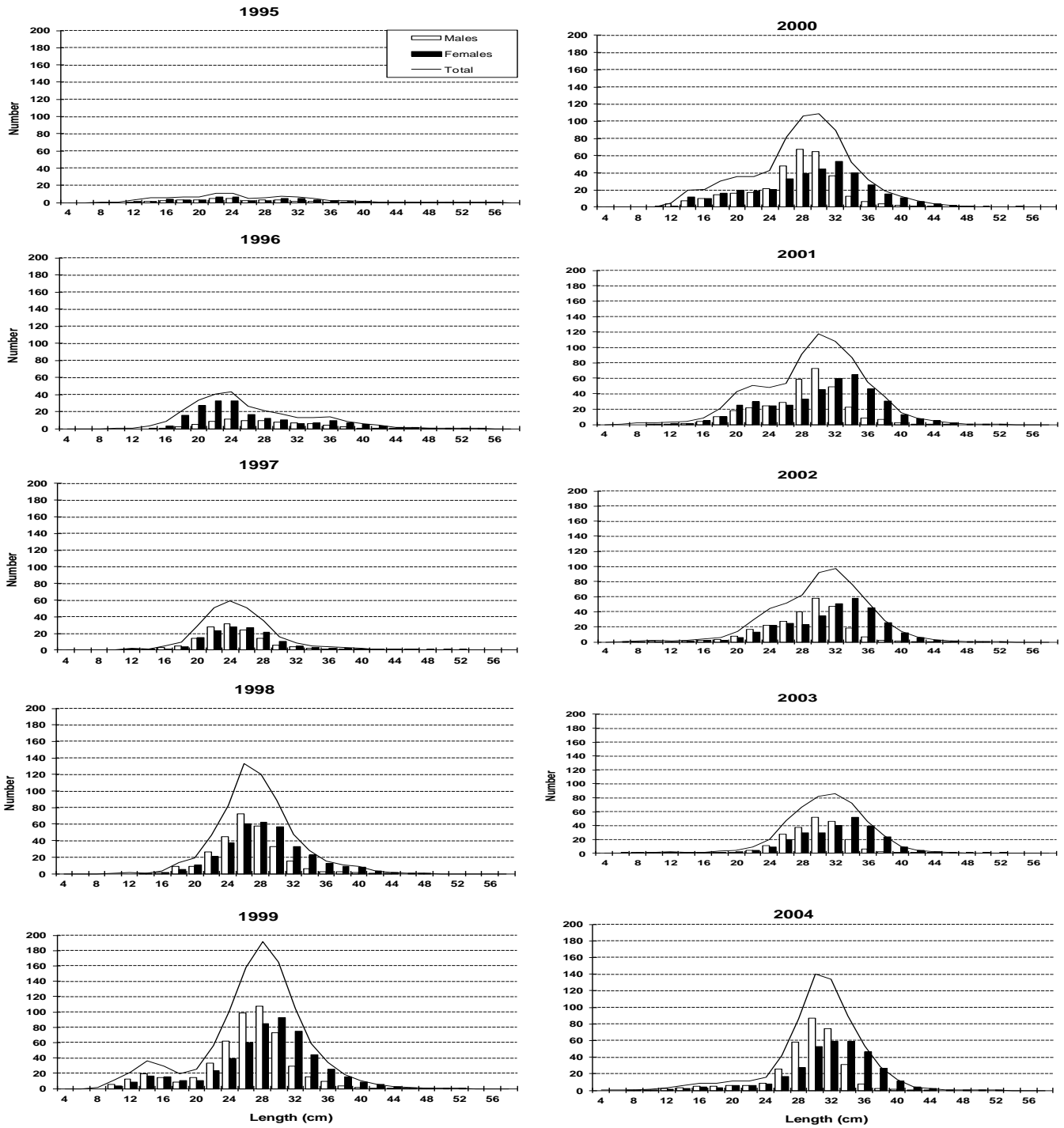
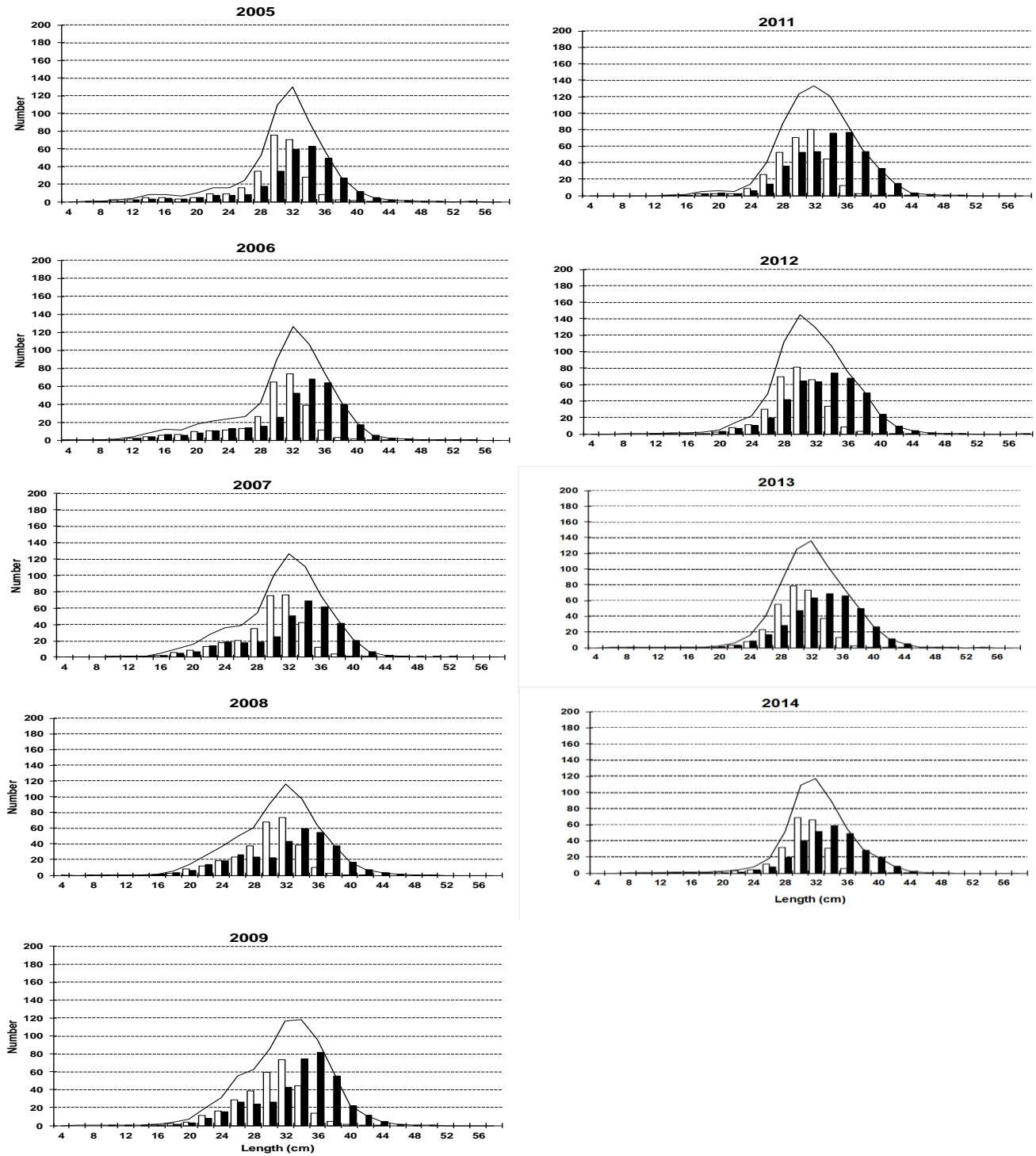


Figure 5. Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2014. Mean catches per tow number. Data from 2010 to 2014 are in Table 8; data for 1995-2009 can be seen in SCR Doc 13/11.



**Figure 5 (cont.).**

Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2014. Mean catches per tow number. Data from 2010 to 2014 are in Table 8; data for 1995-2009 can be seen in SCR Doc 13/11.

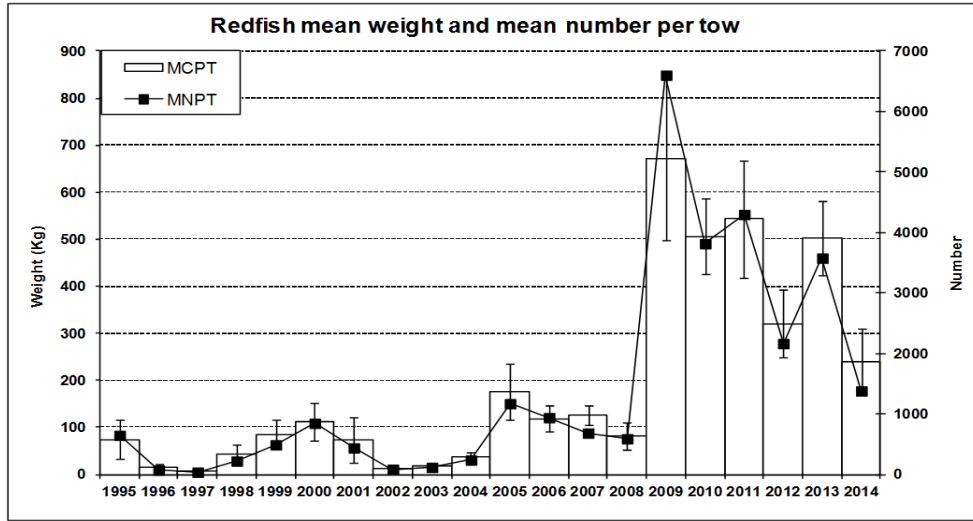


Figure 6. Redfish stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2014.

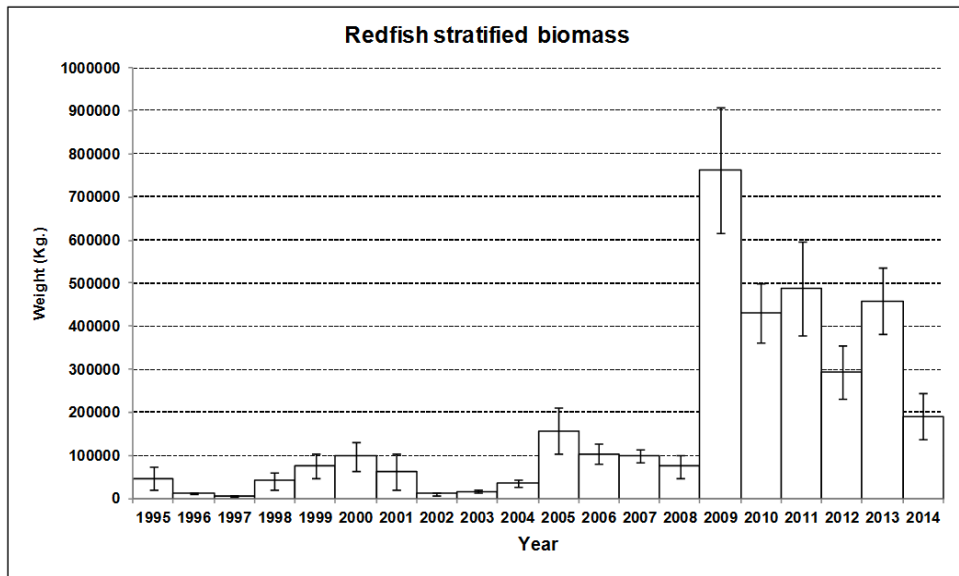


Figure 7. Redfish biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2014.



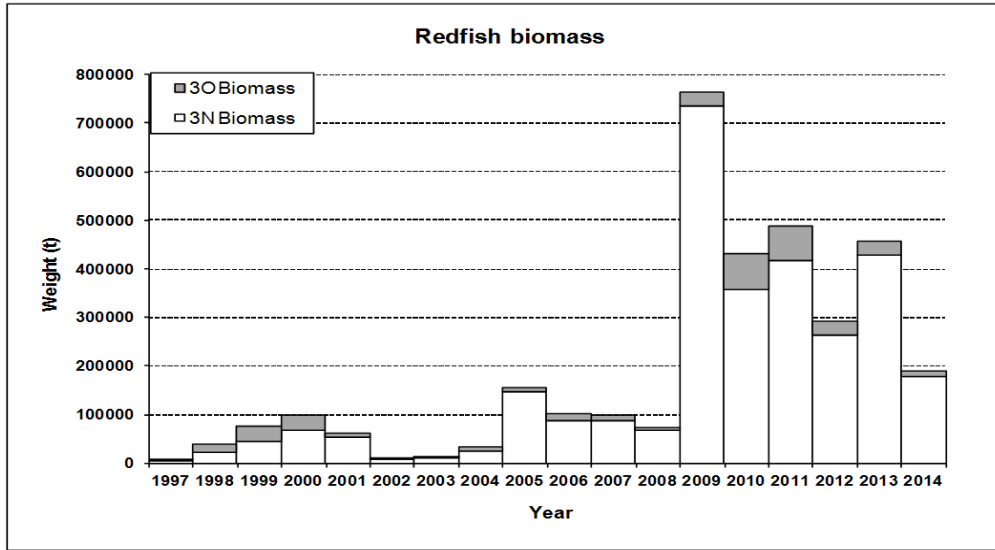


Figure 8. Redfish biomass calculated by the swept area method in tons by year and Division. Spanish Spring surveys in NAFO Div. 3NO: 1997-2014.

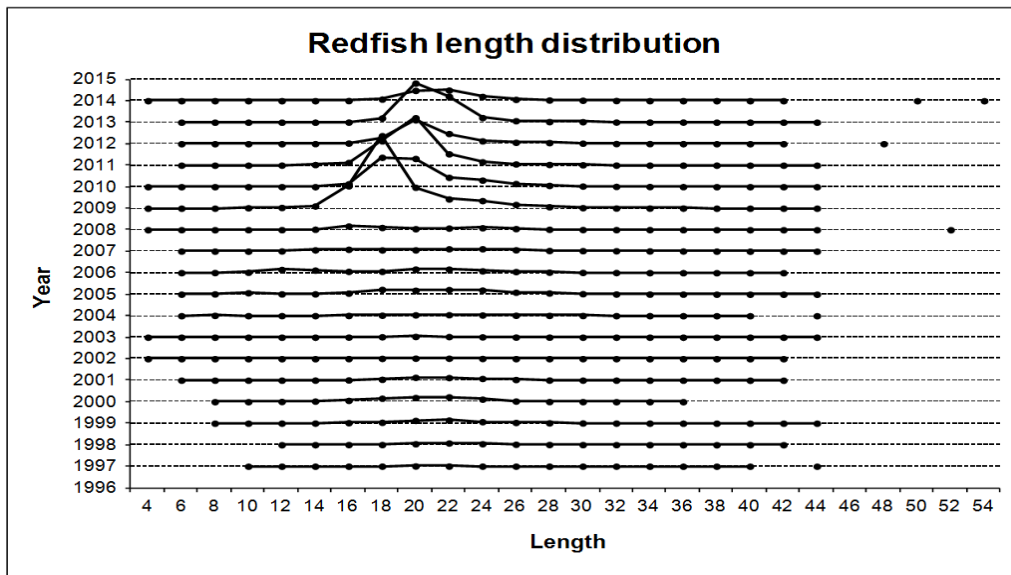


Figure 9. Redfish mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2014. Data from 2010 to 2014 are in Table 14; the data for 1997-2009 can be seen in SCR Doc 13/11.

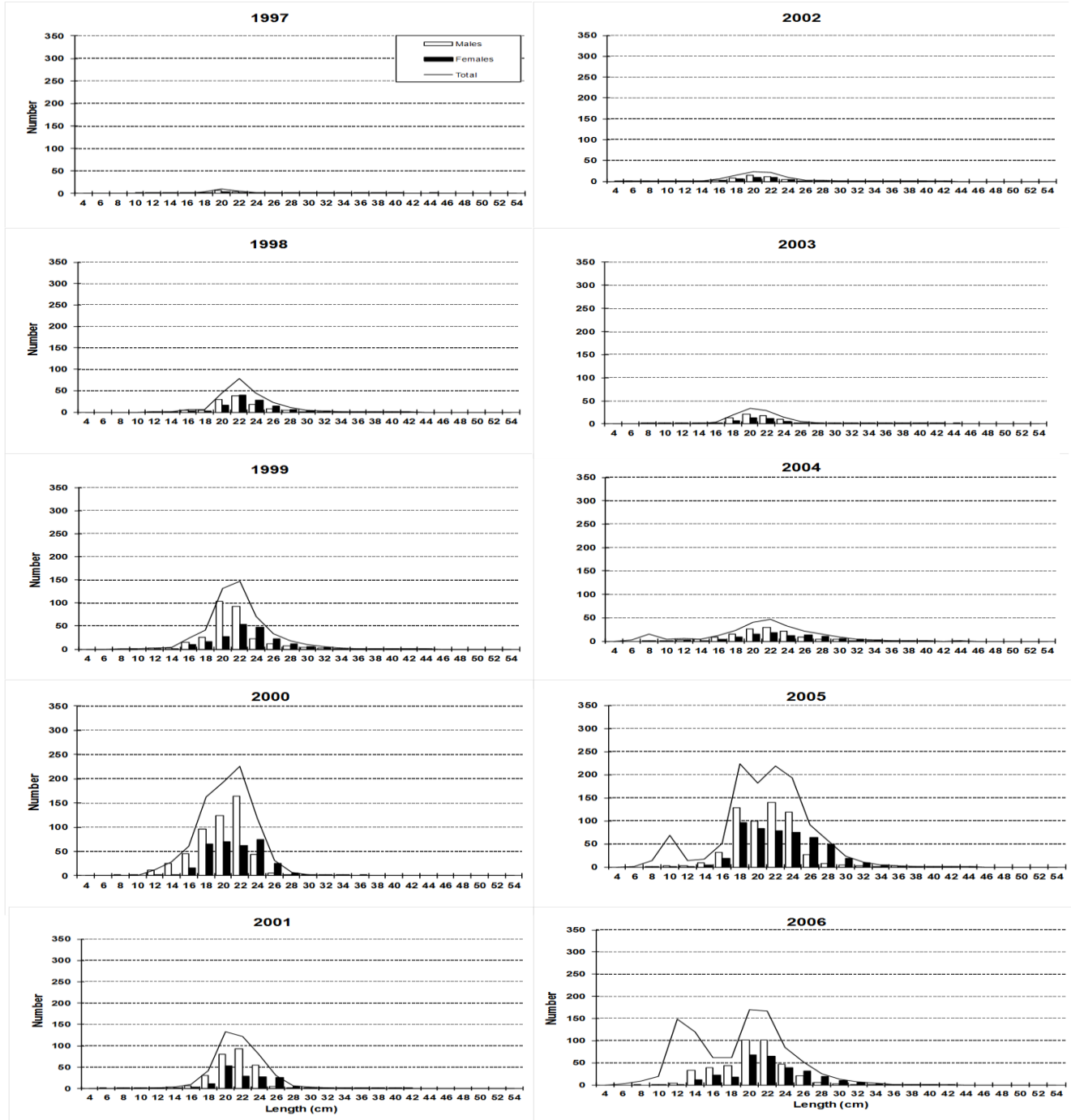


Figure 10. Redfish length distribution (cm) on NAFO 3NO: 1997-2014. Mean catches per tow number. Data from 2010 to 2014 are in Table 14; the data for 1997-2009 can be seen in SCR Doc 13/11.

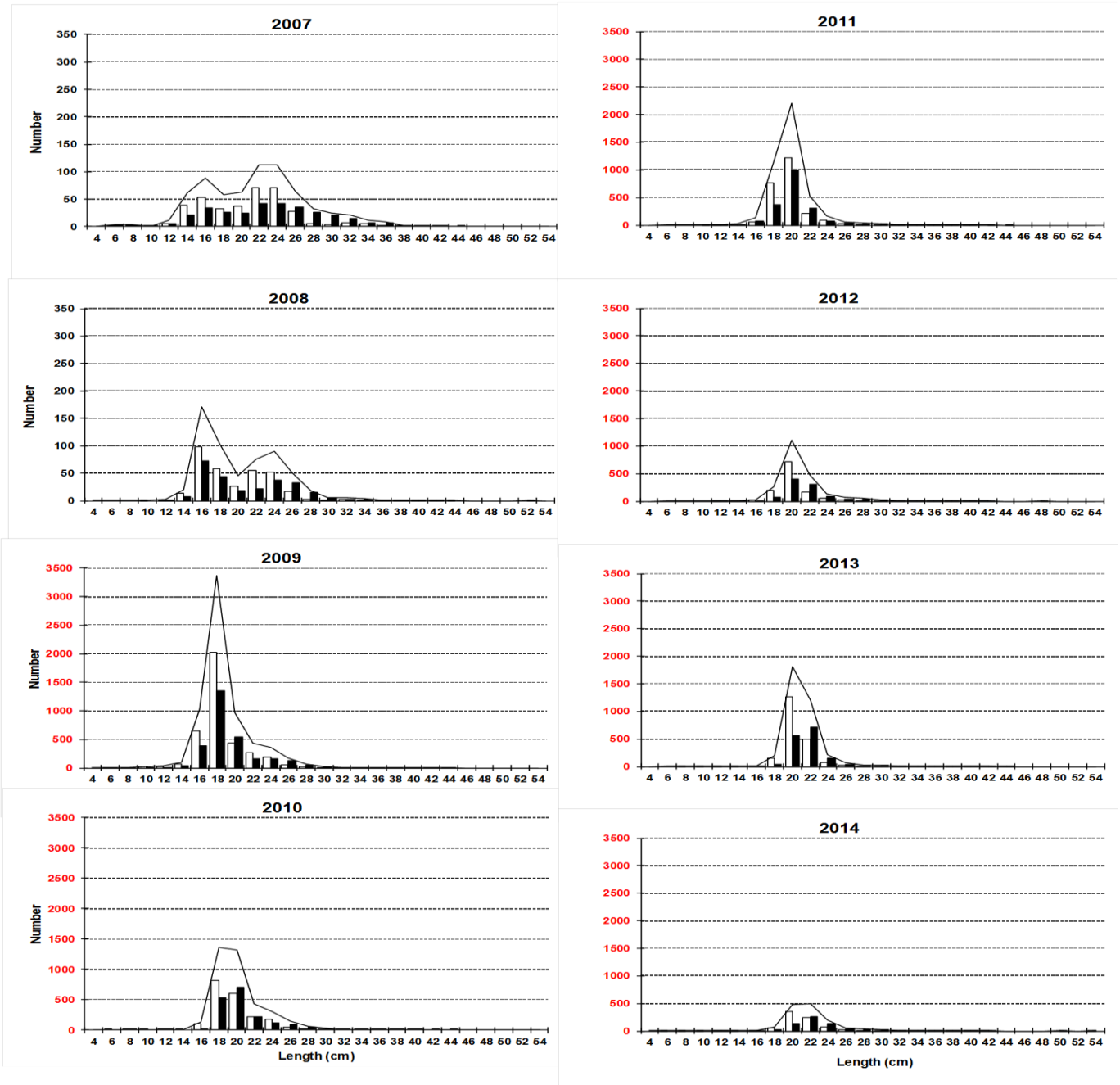


Figure 10 (cont.).

Redfish length distribution (cm) on NAFO 3NO: 1997-2014. Mean catches per tow number. The data from 2010 to 2014 is in Table 8; the data for 1997-2009 can be seen in SCR Doc 13/11. The 2009-2014 graphs have a different y-axis upper limit.

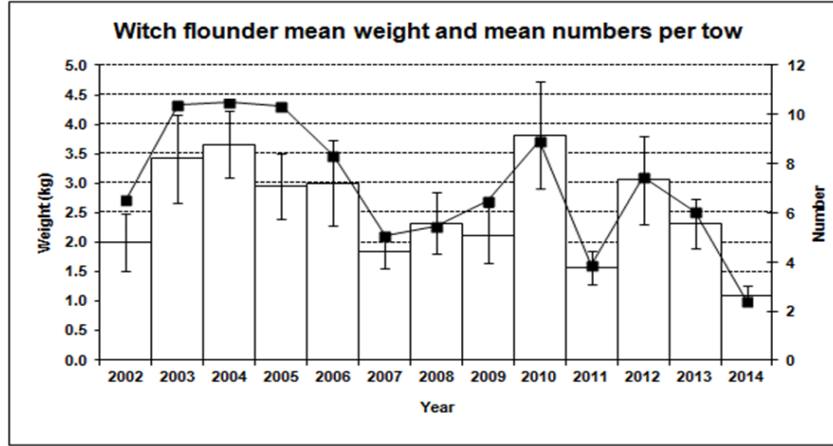


Figure 11. Witch flounder stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2014.

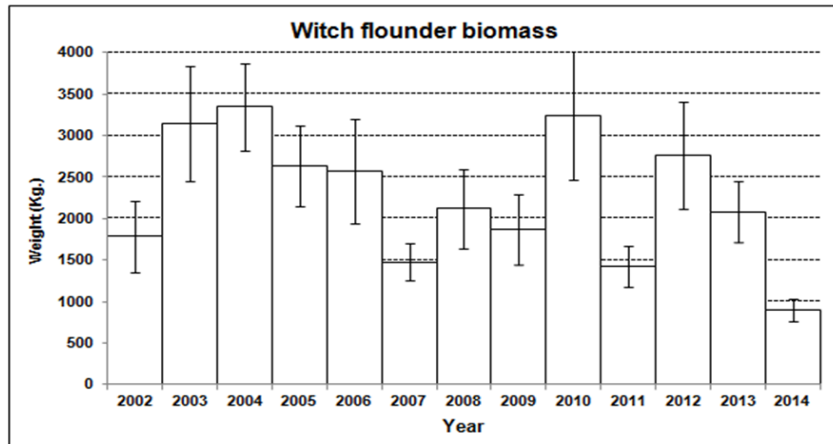


Figure 12. Witch flounder biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2014.

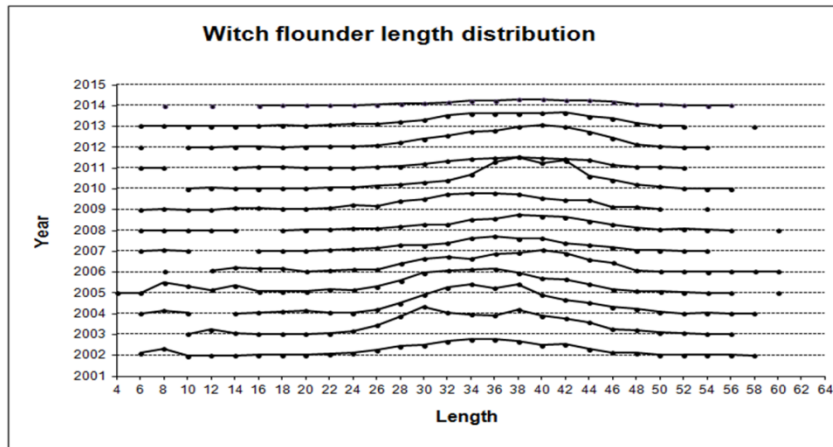


Figure 13. Witch flounder mean catches per tow length distribution (cm) on NAFO 3NO: 2002-2014. Data from 2010 to 2014 are in Table 20; Data for 1997-2009 can be seen in SCR Doc 13/11.

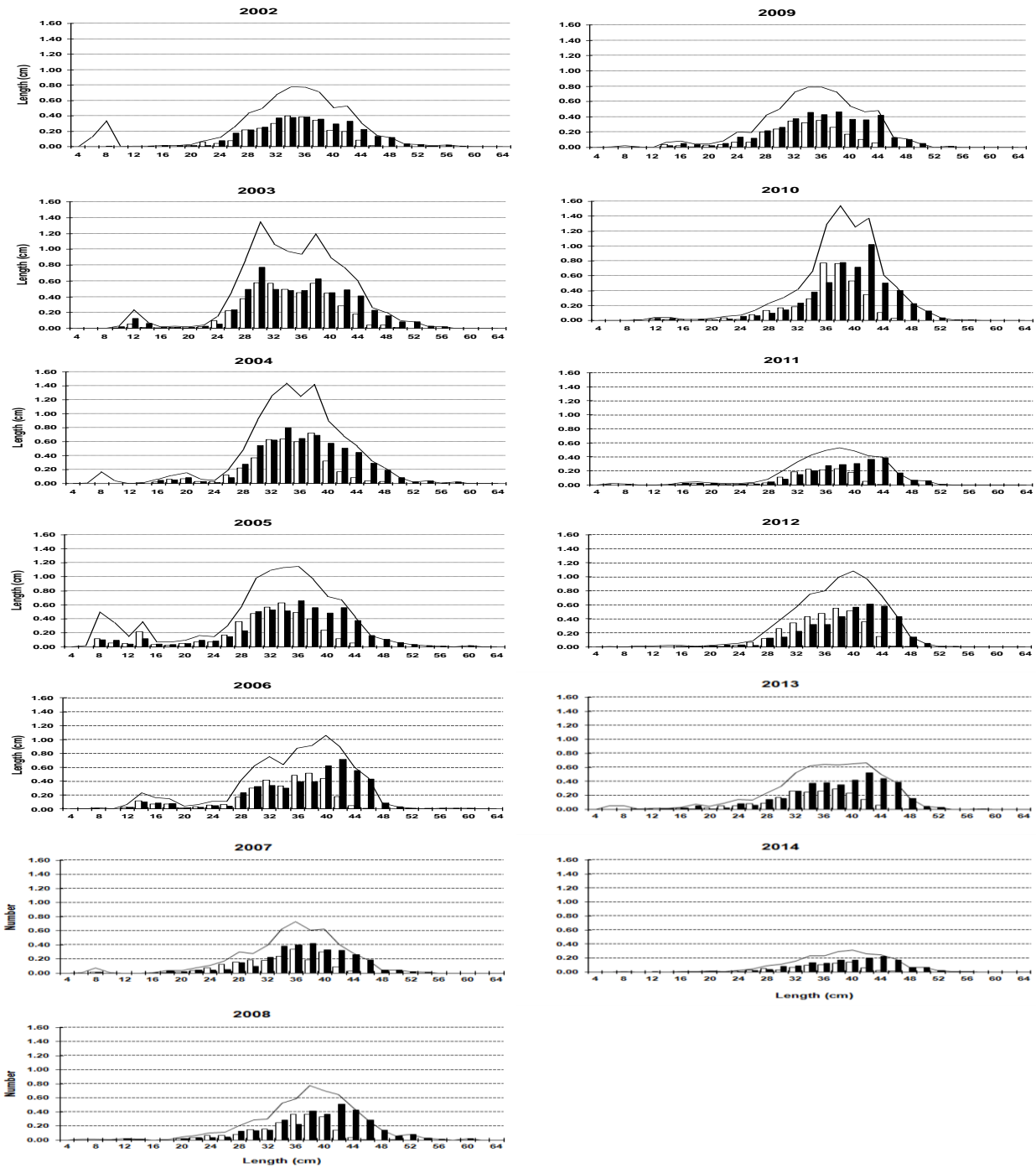


Figure 14. Witch flounder length distribution (cm) on NAFO 3NO: 2002-2014. Mean catches per tow numbers. Data from 2010 to 2014 are in Table 20; Data for 1997-2009 can be seen in SCR Doc 13/11.